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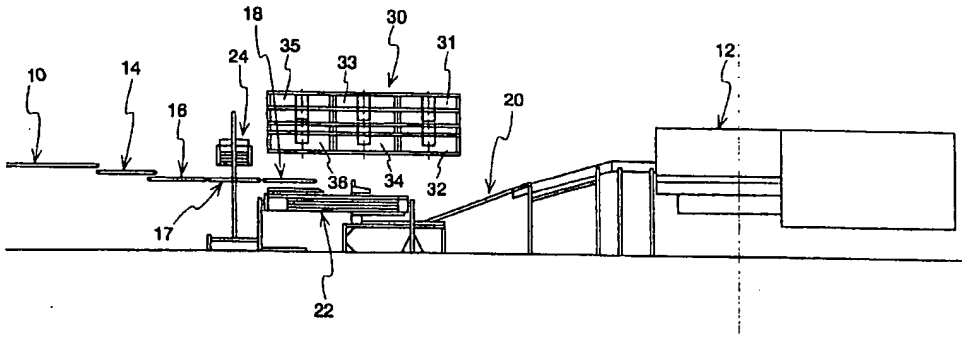
(54) Title: APPARATUS, SYSTEM AND METHOD FOR LOADING OBJECTS INTO PACKAGES



(57) Abstract: An apparatus for loading an object into a package includes a loading fork 60, a conveyor 18 for delivering the product to said loading fork 60, a loading horn 110, said loading horn 110 and said loading fork 60 being movalbe relative to each other to place said bag over said product. A system for loading an object into a package includes a loading fork 60 to receive an object from a conveyor 18, loading apparatus 22 to load the object into a package while located on the loading fork 60 and means to transfer the object and package together from the loading fork to a takeaway conveyor 20. A method of loading an object into a package is also disclosed.

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APPARATUS, SYSTEM AND METHOD FOR LOADING OBJECTS INTO PACKAGES

FIELD OF THE INVENTION

The present invention relates generally to a method and apparatus for loading objects into packages and more particularly, but not exclusively to a method and apparatus that loads various sizes of cuts of meat into plastic bags.

BACKGROUND ART

There is an urgent need in the meat packing industry to reduce labor costs and improve overall efficiency. One area in which the meat packing industry can achieve these objectives is the area of packing cuts of meat into plastic bags.

As an animal carcass is processed in a meat packing plant, the carcass travels along various conveyors and is separated into the various cuts of meat at different workstations. Meat packing plants pack various cuts of meat, such as striploins, tenderloins and rumps, into plastic bags prior to shipment. In some meat plants, the various cuts of meat are sorted and each cut is eventually placed on a specific conveyor with like cuts and then delivered to a workroom where it is then packed into a package, such as a plastic bag. In other plants, the various cuts of meat are not sorted and are all placed on the same conveyor, where the various cuts are packed into plastic bags.

The process of loading the cuts of meat into plastic bags has been done manually by a person who picks the cut of meat up off the line and places it into a plastic bag and then returns the bagged meat onto another line or conveyor so it can travel to the next station. Machines have also been used in an effort to automate the process of loading cuts of meat into plastic bags.

Traditional manual methods and machines used by the meat packing industry have proved to have disadvantages and limitations. For example, some machines use a pneumatic ram that forces or stuffs the meat into the bag. These machines can only handle certain widths of cuts of meat and cannot be used to pack cuts that are not rigid and are easily deformable. As a result, additional lines are needed in a meat packing plant to handle the cuts of meat that cannot be fed into this type of machine. The additional lines take up valuable floor space that could be better used for other functions.

Another known machine for bagging cuts of meat is a belt loader machine. Belt loaders have numerous conveyor belts that transport a cut of meat into a bag as the bag is pulled over the ends of the belts. To accommodate the number of conveyor belts and the thickness of each of the conveyor belts, use of larger, oversized bags is required. Furthermore, a worker must have a high degree of skill to efficiently operate and bag meat on a belt loader machine.

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

OBJECTS OF THE INVENTION

It is one of the principal objectives of one embodiment of the present invention to provide a machine for loading objects, such as cuts of meat, into bags which overcomes or alleviates problems in machines for loading objects at present.

It is another objective of one embodiment of the present invention to provide an apparatus that reduces labor involved with packing cuts of meat into plastic bags.

It is another objective of one embodiment of the present invention to automate the meat packing process.

It is another objective of one embodiment of the present invention to reduce costs in packing meat by reducing the use of oversized plastic bags.

It is another objective of one embodiment of the present invention to improve the overall efficiency of the meat packing process.

The above objects are to be read disjunctively with the alternative object of the invention to provide the public with a useful choice.

These and other objects of the invention will become apparent from the following description.

SUMMARY OF THE INVENTION

According to one aspect of the present invention there is provided apparatus for loading an object into a package including a frame, at least one loading fork movably mounted to said frame, and a loading horn for holding a package, said loading horn and said loading fork being movable relative to each other to load said object into a package while the object is located on said loading fork.

According to another aspect of the present invention there is provided a system for loading an object into a package including:

an infeed conveyor;

loading apparatus located downstream of said infeed conveyor, said loading apparatus including a frame, at least one loading fork movably mounted to said frame to receive an object

from said infeed conveyor and move the object away from the infeed conveyor, and means to load said object into a package while the object is on said loading fork;

and a take-away conveyor located downstream of said loading apparatus,

wherein the loading apparatus includes means to transfer the object and package together from the loading fork to said take-away conveyor.

According to a further aspect of the invention there is provided a method of loading objects into a package, the method including locating the package about a loading horn, placing the object onto a loading fork and moving the loading fork relative to the loading horn so as to move the object into said package located about the loading horn.

According to a still further aspect of the invention there is provided a method of loading an object into a package including feeding an object onto a loading fork movably mounted to a frame, loading said object into a package while the object is on said loading fork, and transferring the object and package from the loading fork to a takeaway conveyor.

Further aspects of the present invention may become apparent to those skilled in the relevant arts from the following description, which is given by way of example only and in reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a portion of a meat packing line which includes the loading apparatus of the present invention.

FIG. 2 is a perspective view of the apparatus of the present invention with a cut of meat shown on an infeed conveyor and a take-away conveyor.

FIG. 3 is a perspective view of the apparatus shown in FIG. 2, with a cut of meat shown just prior to reaching the end of the infeed conveyor.

FIG. 4 is a perspective view of the apparatus shown in FIG. 2, with the cut of meat shown being loaded onto a loading fork.

FIG. 5 is a perspective view of the apparatus shown in FIG. 2, with the cut of meat shown on the loading fork and inside a plastic bag.

FIG. 6 is a perspective view of the apparatus shown in FIG. 2, with the bagged cut of meat shown being transferred to a take-away conveyor.

FIG. 7 is a perspective view of a loading fork that can be used with the apparatus of the present invention.

FIG. 8 is a perspective view of a loading horn that can be used with the apparatus of the present invention, shown in a closed position.

FIG. 9 is a perspective view of the loading horn or FIG. 8, shown in an open position.

DETAILED DESCRIPTION OF THE DRAWINGS

While the present loading device is susceptible of several constructions, there is shown in FIG. 1, a system and apparatus for loading cuts of meat into bags according to the present invention. The system shown is adapted for use in a meat packing plant and designed to be placed in a production line that carries meat from a main conveyor 10, to a vacuum pack station 12. However, those skilled in the relevant arts will appreciate that the present invention will also have applications other than meat packing.

The upstream or infeed conveyor assembly of the system includes a timing conveyor 18 and a scale conveyor 17. These may be automatically operated to ensure that only a single cut of meat is present on the timing conveyor at any one time, allowing the timing conveyor 18 to transport individual cuts of meat to a loading fork carriage assembly 22, which bags the cuts of meat. One or more further conveyors, in this case three conveyors 10, 14 and 16 may be provided to accumulate and control the movement of cuts of meat to the scale conveyor 17 and/or timing conveyor 18. Those skilled in the relevant arts will appreciate that there a numerous control strategies that may be used for conveying cuts of meat to the timing conveyor 18. The downstream or take-away conveyor assembly of the system includes a take-away conveyor 20 which transports the bagged meat 142 to the vacuum pack station 12. In between the upstream conveyor assembly and the downstream conveyor assembly is the loading fork carriage assembly 22.

The main conveyor 10 transports a product, such as a cut of meat 142, from the cutting area (not shown) to an optional accumulating station 14. At the accumulating station 14, the cuts of meat are accumulated and held until they are placed onto the infeed conveyor 16. The infeed conveyor 16, scale conveyor 17 are operated to separate or space the individual cuts of meat before they reach the timing conveyor 18. The timing conveyor 18 can have guides (not shown) thereon. The guides center the cuts of meat so that they are positioned exactly in the middle of the timing conveyor 18 as they are fed to the loading fork carriage assembly 22.

The timing conveyor 18 moves at a controlled speed. By controlling the speed of the timing conveyor 18 along with the alignment and separation of the cuts of meat, a desired spacing and timing between the cuts of meat reaching the end of the timing conveyor 18 is

achieved so as to coincide with the travel of a loading fork 60 below the end of the timing conveyor 18 (see herein below).

A sensor can be provided on or near the scale conveyor 17 or timing conveyor 18 to detect each cut of meat as it passes a certain point. When a cut of meat is detected, the sensor sends a signal to a controller indicating that a cut of meat will be delivered to the loading fork carriage assembly 22 at a known time.

The scale conveyor 17 can contain an in-line belt scale that can weigh each cut of meat to be bagged. An automatic cut-sizing device 24 can also be installed on or near the scale conveyor 17 or the infeed conveyor 16 to detect information about the size of the cut of meat. The sensor, the cut-sizing device 24 and belt scale can all be coupled to a controller in order to send information to the controller that can be used for a variety of purposes, some of which are described below. A variety of exemplary uses are also described in PCT/NZ97/00127, which is hereby incorporated by reference.

Also shown in FIG. 1 is a wall 30 of six of machines 31, 32, 33, 34, 35 and 36 that produce plastic bags. These machines 31, 32, 33, 34, 35 and 36 are shown schematically, but can be of the type described in U.S. Patent No. 5,618,252 and 5,816,990, which are hereby incorporated by reference. The machines 31, 32, 33, 34, 35 and 36 can contain various widths of plastic material so that a variety of width bags can be produced depending on the size of the cut of meat to be bagged. The width of the bag to be produced can be determined from the information the controller receives from the in-line belt-scale and cut-sizing device 24. The controller can be coupled to the machines 31, 32, 33, 34, 35 and 36 and can send a signal to instruct a specific machine to make a bag for a particular cut of meat. The information can also

be used to print certain information about the cut of meat directly onto the bag or on tags, labels or other identifying devices that can be used in association with the bags or meat.

As shown in FIGS. 2-6, the loading fork carriage assembly 22 has an upstream frame support member 40 and a downstream frame support member 42. The upstream frame support member 40 is positioned near and partly underneath, the timing conveyor 18. The downstream frame support member 42 is positioned near the take-away conveyor 20. The two frame support members 40 and 42 support a loading fork frame 44. The loading fork frame 44 is rotationally mounted to the frame support members 40 and 42 by pins 46 and 48. A motor 51 on the upstream support member 40 controls the rotational movement of the frame 44 and causes the frame 44 to rotate about the pins 46 and 48. The frame 44 has two sets of rails 50 and 52, the first set of rails 50 is shown on the upper side of the frame 44 in FIGS. 2-5 and the second set of rails 52 is shown on the lower side of the frame 44 in FIGS. 2-5. In FIG. 6, the set of rails 50 is on the lower side and the set of rails 52 is on the upper side.

One of the forks 60 is mounted on a first set of rails 50. The other fork 62 is mounted on a second set of rails 52. The rails 50 and 52 can be I-beams, rods, box sections or any other commonly used member that allows loading forks 60 and 62 to move longitudinally with respect to the frame 44. The loading forks 60 and 62 are movable along the rails 50 and 52 by a drive belt. Any other suitable means to move the loading forks may be used as required. The belt is driven by a motor and drives both the forks 60 and 62 along the rails 50 and 52, respectively. The upper fork 60 moves from the position shown in FIG. 2 along its rails 50 in the downstream direction, i.e., from the timing conveyor 18 towards the take away conveyor 20, while the lower fork 62 moves along its rails 52 in reciprocal opposite movement in an upstream direction. The

upper fork 60 advances along the rails 50 at the same speed and direction as the timing conveyor 18, so that, as the cut falls off the end of the timing conveyor 18 the end of the loading fork 60 meets the leading edge of the cut of meat.

Referring now to FIG. 7, one of the forks 60 is shown. The loading fork 60 has a center shoe 70 which has a left portion 72 and right portion 73 which slope upwardly and outwardly from a lower central point. The center shoe 70 is preferably approximately 100 mm wide and 800 mm long. The center shoe 70 may be slightly cupped or V-shaped to hold the cut of meat. Due to its shape the center shoe 70 is able to hold smaller cuts of meat as well as larger cuts of meat.

The fork 60 also has two inner fingers 74 and 76. Preferably, the inner fingers 74 and 76 are stainless steel tubes which are approximately 10 mm in diameter. The inner fingers 74 and 76 are preferably approximately 700 mm long. The back ends 78 and 80 of the inner fingers 74 and 76 extend approximately 20 mm behind a loading fork cross piece 82 and the front ends 83 and 84 of the fingers 74 and 76 extend approximately 700 mm forward of the cross piece 82.

The fork 60 also has two outer fingers 86 and 88. Preferably, the outer fingers 86 and 88 are also stainless steel tubes which are approximately 10 mm in diameter and approximately 600 mm long. The inner fingers 74 and 76 and outer fingers 86 and 88 are preferably generally tubular and hollow, but can be any shape that will adequately support the cuts of meat. The inner fingers 74, 76 are positioned slightly higher than the center shoe 70, and the outer fingers 86 and 88 are positioned slightly higher than the inner fingers 74 and 76. The overall configuration of the fork 60 is generally V-shaped to hold the cuts of meat better and to be able to hold a variety of sizes of meat.

The hollow inner fingers 74 and 76 allow air to be blown therethrough. A compressor (not shown) can be coupled to the fingers 74 and 76 by tubes 77 and 79 and blow compressed air into the back ends 78 and 80 of the fingers 74 and 76 through the tubes 77 and 79. Near the back ends 78 and 80 of the fingers 74 and 76, there are two venting holes 90 and 92, which are approximately 3mm in diameter. The holes 90 and 92 are drilled through the fingers 74 and 76 to allow more air to enter the fingers 74 and 76 when the compressed air is being blown into the fingers 74 and 76 by the compressor. The air is blown through the inner fingers 74 and 76 and out holes 94 and 96 in the front ends 83 and 84 of the fingers 74 and 76. A deflector 100 is positioned at the front end 83 and 84 of each of the fingers 74 and 76 to direct the air slightly upwardly to facilitate opening the bag by lifting the bag away from the cut of meat, making it easier to pull the bag over the cut of meat and fork 60. The deflectors 100 may be integrally formed from fingers 74 and 76 by cutting a slot at the top surface near the end of each finger 74 and 76. In one embodiment of the present invention, inner fingers 74 and 76 are stainless steel hollow tubes with capped front ends 83 and 84. In this embodiment, the deflectors 100 are formed by cutting and removing a portion of the top surface of the capped inner fingers 74 and 76 at a 45 degree angle leaving the capped ends in place as deflectors 100. In such an embodiment, air flows through the inner fingers 74 and 76, makes contact with the sloped capped ends of fingers 74 and 76, and is directed upwards at a 45 degree angle through the opening created by the removal of the portion of the top surface of the inner fingers 74 and 76.

The air blown out holes 94 and 96 may be particularly useful if a loading horn is not used. An operator may place the bag directly onto the fork 60 about the cut of meat. The air

may assist the operator to open the bag, which can be time consuming as it is often difficult to separate the sides of the bag.

The fork 60 is supported by a frame 98 which is attached to the cross piece 82 of the fork 60, so that the fork 60, when mounted on the frame 98 looks like a sideways U with the open end forward and half the leading edge of the lower arm removed. The objective is to centrally support the fork 60, while allowing the bag to be pulled the full length of the fork 60 without restriction.

Referring now to FIGS. 8 and 9, the loading horn 110 can have two side plates 112 and 114, which are generally triangular in shape with the apexes 116 and 118 to the front edge of the side plates 112 and 114 so that a bag can be easily pulled onto the front edge of the loading horn 116 and 118. In the closed position shown in FIG. 8, the rear edges of the side plates 112 and 114 form an opening that is preferably approximately 100mm wide. The front edges of the side plates 112 and 114 are virtually closed to allow the bag to be easily pulled over.

Once the bag is pulled onto the loading horn 110 a sensor (not shown) can detect the placement of the bag and the horn 110 is moved to an open position shown in FIG. 9. The front edges of the side plates 112 and 114 are pulled apart by pneumatic rams 120 and 122 (see also FIGS. 3 and 4) until further expansion of the plates 112 and 114 is restricted by the bag, thus holding the bag in place on the loading horn 110. The rams can also stretch the bag outwardly to allow a larger cut of meat to be placed in the bag.

The front edges of the loading horn 110 may be flared slightly outwardly so the fingers 74, 76, 86, 88 of the loading fork 60 can hit the horn 110 and push the horn 110 outwards

allowing the fork 60 or a central portion of it to pass inside the horn 110 and avoiding the loading fork 60 hitting the edge of the loading horn 110.

In one embodiment of the invention, the loading fork 60 retracts from the loading horn 110 once a bag has been pulled over the cut of meat. Once the cut has passed through the loading horn 110 and the bag has been pulled off it by the action of the loading fork 60 passing through the horn 110, the pneumatic rams 120 and 122 return the loading horn 110 from its open position (FIG. 9) back to the closed position (FIG. 8), thus preventing the cut from returning with the fork 60 as the loading fork 60 retracts and allowing the loading horn 110 to be ready to accept the next bag. This retraction of the loading fork 60 is required for smaller bags, where the loading horn 110 extends only around an inner portion of the loading fork 60. For larger bags where the outer fingers 86, 88 pass through the center of the loading horn 110, the loading fork may optionally continue through the loading horn 110 along with the bagged cut of meat.

The loading horn 110 is mounted to a frame 130 that suspends the horn 110 over the loading fork frame 44 (see FIGS. 2-6.). The horn 110 can be fixedly mounted on to the frame 44, or can be mounted on rails 132 and 134 so that the horn 110 can move relative to the loading fork frame 44.

In another embodiment of the invention, which may be preferred due to avoiding the requirement for the abovementioned retraction of the loading fork 60, the loading horn 110 may be modified to allow the loading fork 60 to continue through the loading horn 110 along with the bagged cut of meat even when the bag only extends over an inner portion of the loading fork 60, for example, extending over the inner fingers 74, 76 and not the outer fingers 86, 88. The modified loading horn includes an upper and lower portion and opens along a substantially

vertical axis, rather than along the horizontal axis of the loading horn 110. The lower portion includes a split to allow the loading fork 60 to travel past it. More particularly, the lower portion includes a split that provides a channel along which the frame 98 (see Figure 7) can travel.

The modified loading horn may include a number of horizontally spaced fingers along its upper lower portions, allowing an operator to place a bag around the appropriate fingers according to its size. The upper portion may be pivotally engaged to a frame to allow the distal end, corresponding to apexes 116, 118 of the loading horn 110, to pivot down towards the lower portion to place the modified loading horn in a closed position to enable easier placement of bags onto the horn. The upper portion would pivot upwards into an open position to hold the bag ready for placement of a cut of meat therein. Alternatively, the upper and lower portions may remain substantially parallel to each other and move vertically relative to each other to open and close the loading horn.

In a further alternative embodiment, a further modified loading horn may be used to avoid an operator having to select the fingers of the loading horn. The further modified loading horn has upper and lower portions and opens vertically like the modified loading horn described above. The lower portion of the further modified loading horn includes two horizontally moveable parts that are together in when in a closed position and apart in the horizontal plane when in an open position. The movement of the two parts between the closed and open position would correspond to the movement of the upper and lower portions between the closed and open position. The upper portion of the further modified loading horn may also include two parts that reflect the movements of the lower portion parts, resulting in the opening of the bag being held in a square shape to receive cuts of meat. If the upper portion has only a single part, larger bags

may be held in a triangular or trapezoidal shape to receive cuts of meat. If more than four moveable parts are provided, the bag may be held open in different shapes, although it is not anticipated that this will be required for meat cuts.

Should the loading fork 60 be mounted on a different frame 98, not having a central support member, the split in the lower portion of the horn in the modified and further modified loading horns may need to be moved correspondingly.

What loading horn is used (loading horn 110, the modified loading horn, or the further modified loading horn) will depend on the requirements for the particular application. For example, cost considerations and the relative complexity and number of actuating mechanisms required to move the parts or portions of the loading horn may affect which horn is most suitable.

Referring now to FIGS. 3-6, operation of the loading device will be described. The loading fork 60, receives the cut of meat from the timing conveyor 18. Because the meat is positioned in the center of the timing conveyor 18, it falls onto the center of the loading fork 60 (FIG. 4). The loading horn 110 has a bag 140 over it and is moved to its open position prior to the fork 60 reaching it. Then the fork 60, carrying the cut of meat on the center shoe 70 and fingers 74, 76, 86 and 88 (depending on the size of the cut of meat) travels along the rails 50 and through the open loading horn 110 over which a bag (not shown) of the correct size has been pulled. The loading fork 60 can continue with the product now inside the bag, and emerge on the other side of the horn 110, removing the bag from the horn 110 (FIG. 5).

As shown in FIG. 6, once the upper loading fork 60 with the cut of meat encased within the bag reaches the end of the first set of rails 50, the frame 44 rotates 180 degrees so that the upper loading fork 60 with the bagged product is positioned upside down and becomes the lower

loading fork and the other, empty fork 62 is brought into an upright position, just underneath the timing conveyor 18 becoming ready to receive the next cut of meat.

The bagged product 141 is suspended from the loading fork 60. The take-away conveyor 20 can be positioned underneath the upside down fork 60 containing the bagged, suspended product. The take-away conveyor 20 could rise, taking the weight of the product off the loading fork 60 and thereby pulling the bagged product from the fork 60 and transporting the product to its destination, leaving the loading fork 60 behind. Other options for removing a bagged cut of meat from the fork 60 can include, but are not limited to, any of the following alternatives.

The take-away conveyor 20 can be controlled by weight sensors (not shown) such that when the sensors detect a bagged cut of meat, the take-away conveyor 20 lifts the cut from the loading fork 60 and transport the cut away. The loading fork 60 can be hinged such that the loading fork 60 may pivot in its inverted horizontal position and drop a suspended bagged cut of meat a short distance onto the take-away conveyor 20. Similarly, the tipping loading fork 60 may come to rest on the take-away conveyor 20 allowing the take-away conveyor 20 to assume the load and remove the bagged cut of meat from the loading fork 60. Furthermore, an unloading arm (not shown) can sweep a suspended bagged cut of meat from the loading fork 60 onto the take-away conveyor 20.

Alternatively, when the loading fork 60 carrying a bagged cut of meat reaches the end of the upper rails 50, the loading fork 60 may come to a stop and a bagged cut of meat can be manually removed from the loading fork 60 and placed on the take-away conveyor 20 before the frame 44 rotates 180 degrees. Similarly, a bagged cut of meat may be swept off the loading fork 60 onto the take-away conveyor 20 by an unloading arm prior to the frame 44 rotation.

The loading forks 60 and drive belt may be configured such that when the loading fork 60 travelling along the upper rails 50 reaches the end of the upper rails 50 the drive belt passes over a horizontal pulley (not shown) thereby tipping the loading fork 60 from a horizontal position along the upper rails 50 through a vertical position and into an inverted horizontal position along the lower rails 52. In this configuration, the bagged cut of meat can fall from under its own weight from the tipping loading fork 60 to the take-away conveyor 20.

The loading horn 110 can be further enhanced by a vacuum head or heads (not shown), which secure the bag to the loading horn 110 as the operator places the bag in position.

Further, the bag can be conveyed to the loading horn 110 by a vacuum head (not shown). The vacuum head selects the bag produced by a bagger machine such as the machine disclosed in U.S. Patent No. 5,816,990 and delivers the bag to the loading horn 110. This vacuum head bag transportation device can be one such as the one disclosed in U.S. Patent No. 5,618,252.

From the foregoing description, it will be apparent that the loading machine of the present invention has a number of advantages, some of which have been described above and others of which are inherent in the machine 10 of the present invention. Also, it will be understood that modifications can be made to the loading machine of the present invention without departing from the teachings of the invention.

Where in the foregoing description reference has been made to specific components or integers having known equivalents, then those equivalents are herein incorporated as if individually set forth.

CLAIMS

1. Apparatus for loading an object into a package including:

a frame;

at least one loading fork movably mounted to said frame; and

a loading horn for holding a package, said loading horn and said loading fork being movable relative to each other to load said object into a package while the object is located on said loading fork.

2. The apparatus of claim 1 wherein said loading horn includes at least two moveable parts, said loading horn having a closed position where said moveable parts are positioned close to each other in order to receive a package and an open position where said moveable parts are spaced apart from each other.

3. The apparatus of claim 2 wherein said at least two movable parts move relative to each other substantially along a horizontal plane.

4. The apparatus of claim 2 wherein said at least two movable parts move relative to each other substantially along a vertical plane.

5. The apparatus of any one of claims 1 to 4 wherein said loading horn includes an upper and a lower portion, the lower portion including a channel through which a support for the loading fork may travel, allowing the loading fork to travel past the loading horn.

6. The apparatus of claim 5, wherein the lower portion includes at least two parts moveable relative to each other, said at least two parts having a closed position for receiving a bag and an open position that defines said channel.

7. The apparatus of either claim 5 or claim 6, wherein said loading fork is supported by a central frame member and said channel is aligned with said central frame member.

8. The apparatus of any one of claims 5 to 7, wherein the upper portion includes at least two parts moveable relative to each other, said at least two parts having a closed position for receiving a bag and an open position.

9. The apparatus of any one of claims 1 to 8 wherein said frame includes a second loading fork mounted on said frame, said second loading fork movable relative to said loading horn.

10. The apparatus of claim 9 wherein said first and said second loading forks are driven by a common drive mechanism.

11. The apparatus of claim 10 wherein said drive mechanism is a drive belt.

12. The apparatus of any one of claims 1 to 11 wherein said frame is rotationally mounted on supports, whereby said frame is rotatable about a longitudinal axis thereof.

13. The apparatus of any one of claims 1 to 12 wherein said frame includes a rail and said fork is mounted on said rail.

14. The apparatus of any one of claims 1 to 13 wherein said fork has a substantially V-shaped center shoe.

15. The apparatus of claim 14 wherein said fork includes fingers located to the sides of and above said center shoe.

16. The apparatus of claim 15 wherein said fingers are hollow tubes having a venting hole therein to assist in placing a package over said fork.

17. The apparatus of either claim 15 or claim 16 wherein said fingers also include a deflector to direct air from said venting holes in a pre-determined direction.

18. The apparatus of any one of claims 1 to 17 wherein said fork is movable from a first position to receive an object thereon, to a second position where said object is at least partially enclosed by a package located about said loading horn and a third position where said object can be transferred to a conveyor.

19. The apparatus of claim 18 wherein said horn includes a channel through which a support for the loading fork may travel, allowing the loading fork to travel past the loading horn to move from said second position to said third position.

20. The apparatus of claim 19 wherein when said loading fork is in the second position, said package encloses at least a portion of the loading fork.

21. The apparatus of any one of claims 18 to 20 wherein in said third position, said fork is inverted with said package enclosing at least a portion of the fork.

22. The apparatus of claim 21 further including means to remove said package from said fork when the fork is inverted.

23. The apparatus of claim 22 wherein said means to remove said package includes a conveyor to raise up to contact said package and convey said package off an end of the fork.

24. The apparatus of any one of claims 18 to 23 including a plurality of loading forks mounted to said frame, each loading fork cycling

through the first, second and third positions and taking a return path back to the first position.

25. The apparatus of claim 2 wherein said parts are coupled to pneumatic rams which operate to move said parts from said closed position to said open position.

26. A system for loading an object into a package including:

an infeed conveyor;

loading apparatus located downstream of said infeed conveyor, said loading apparatus including a frame, at least one loading fork movably mounted to said frame to receive an object from said infeed conveyor and move the object away from the infeed conveyor, and means to load said object into a package while the object is on said loading fork;

and a take-away conveyor located downstream of said loading apparatus,

wherein the loading apparatus includes means to transfer the object and package together from the loading fork to said take-away conveyor.

27. The system of claim 26 wherein said means to load said object into a package while the object is on said loading fork includes a loading horn for holding a package, said loading horn being positioned along a path of movement of said loading fork.

28. The system of claim 27 wherein said loading horn includes at least two moveable parts, said loading horn having a closed position where said moveable parts are positioned close to each other in order to receive a package and an open position where said moveable parts are spaced apart

from each other and the movement of said moveable parts is controlled by a controller.

29. The system of claim 27 or claim 28 wherein said loading fork is supported on a support member and the support member travels between two of said at least two moveable parts to position the object and package onto the loading fork.

30. The system of any one of claims 26 to 29 wherein said frame is pivotally mounted on supports and said frame rotates about a longitudinal axis before the object is transferred to said take-away conveyor.

31. The system of any one of claims 26 to 30 wherein said means to transfer the object and package together from the loading fork to said take-away conveyor includes a conveyor locatable to engage with the package when held by a loading fork in an inverted position due to rotation of said frame.

32. The system of any one of claims 26 to 31 wherein said frame has two or more loading forks mounted thereon.

33. The system of any one of claims 26 to 32 wherein the timing and movement of said fork along said frame is controlled by a controller.

34. The system of any one of claims 26 to 33 wherein said fork includes a plurality of fingers formed by hollow tubes having a venting hole therein to assist in placing a package over said fork.

35. The system of claim 34 wherein said fingers include a deflector to direct air from said venting holes in a pre-determined direction.

36. A method of loading objects into a package, the method including locating the package about a loading horn, placing the object onto

a loading fork and moving the loading fork relative to the loading horn so as to move the object into said package located about the loading horn.

37. The method of claim 36 further including moving the loading fork past the loading horn so as move on said loading fork said package with said object therein away from the loading horn.

38. The method of claim 37 further including inverting said loading fork after moving away from said loading horn and removing said package from said loading horn by conveying the package off the end of the loading fork.

39. A method of loading an object into a package including feeding an object onto a loading fork movably mounted to a frame, loading said object into a package while the object is on said loading fork, and transferring the object and package from the loading fork to a takeaway conveyor.

40. The method of claim 39 wherein the step of loading said object into a package includes locating a package about a loading horn and moving the loading fork with the object thereon into the package.

41. The method of claim 40 further including the step of moving the loading fork past said loading horn to remove the package from the loading horn.

42. The method of any one of claims 39 to 41 further including inverting said loading fork and then conveying the package off the loading fork to transfer the package from the loading fork to the takeaway conveyor.

43. An apparatus or a system for loading objects into packages substantially as herein described with reference to the accompanying drawings.

44. A method of loading objects into packages substantially as herein described with reference to the accompanying drawings.

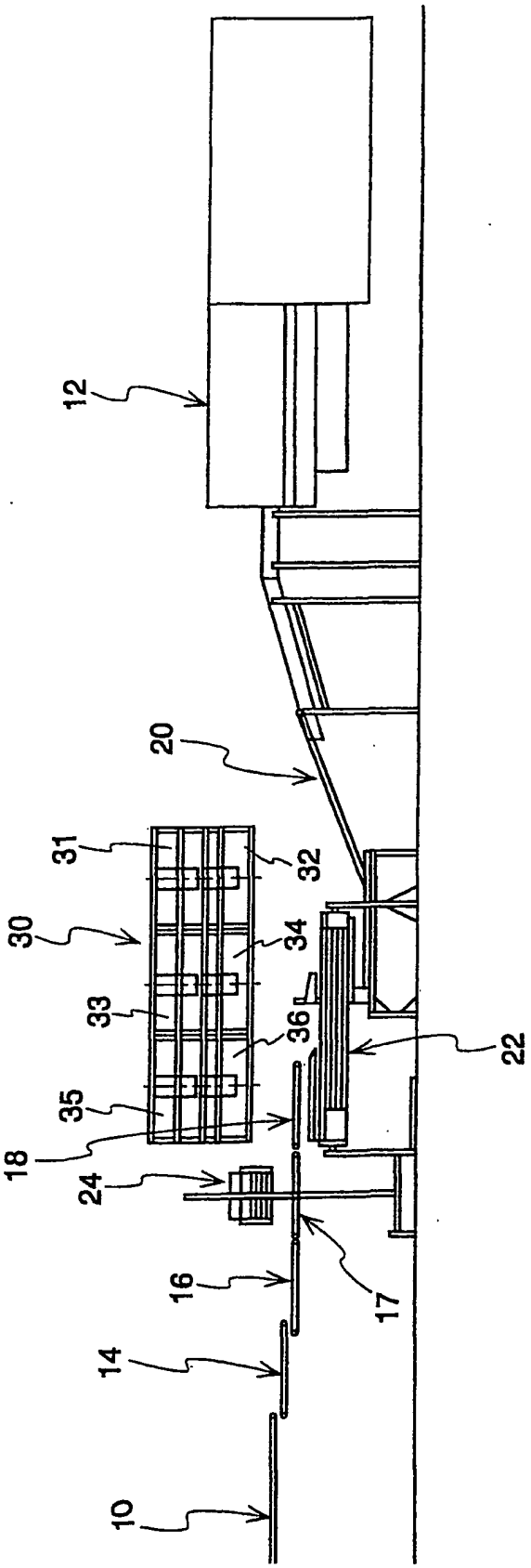

Fig. 1

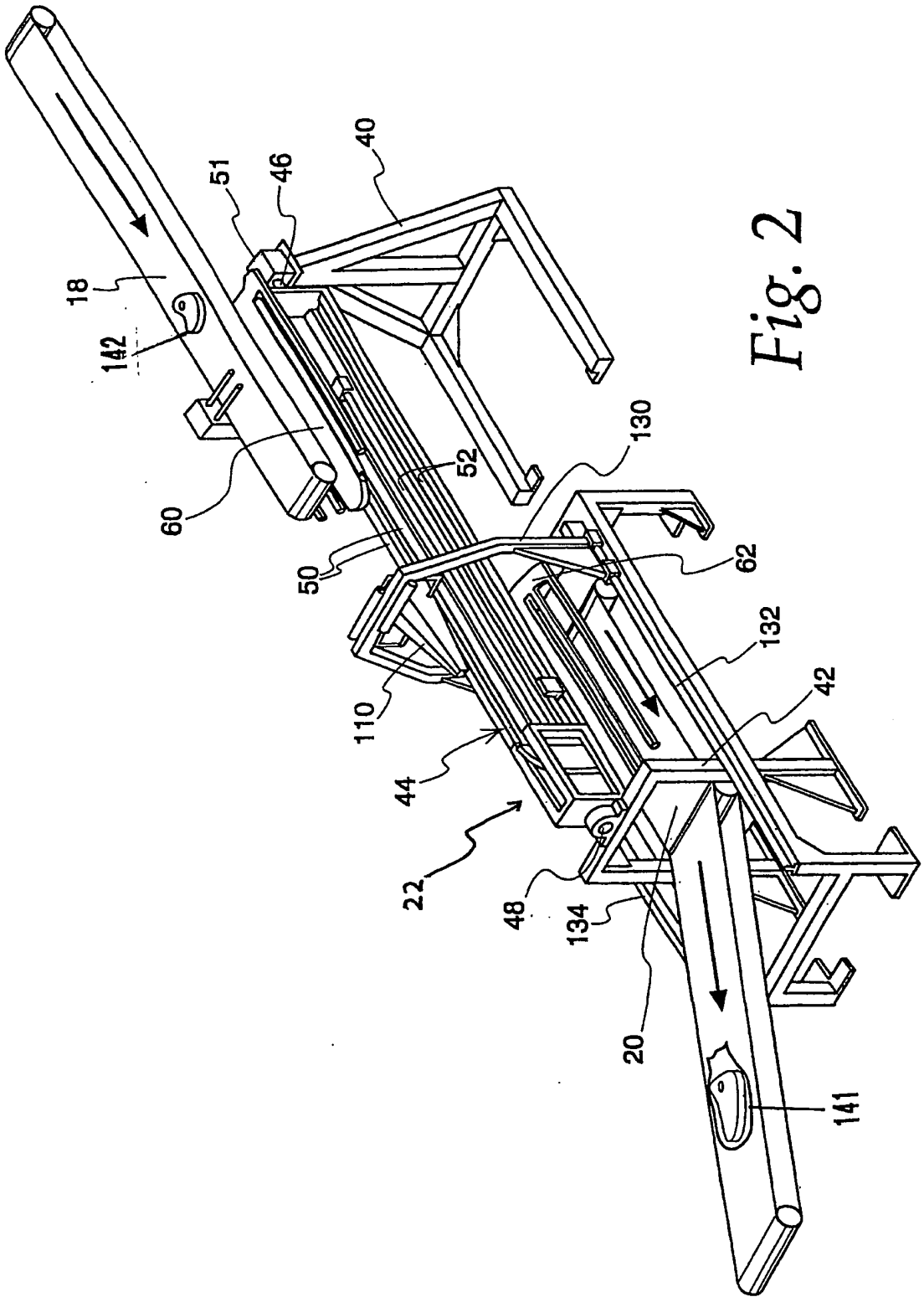

Fig. 2

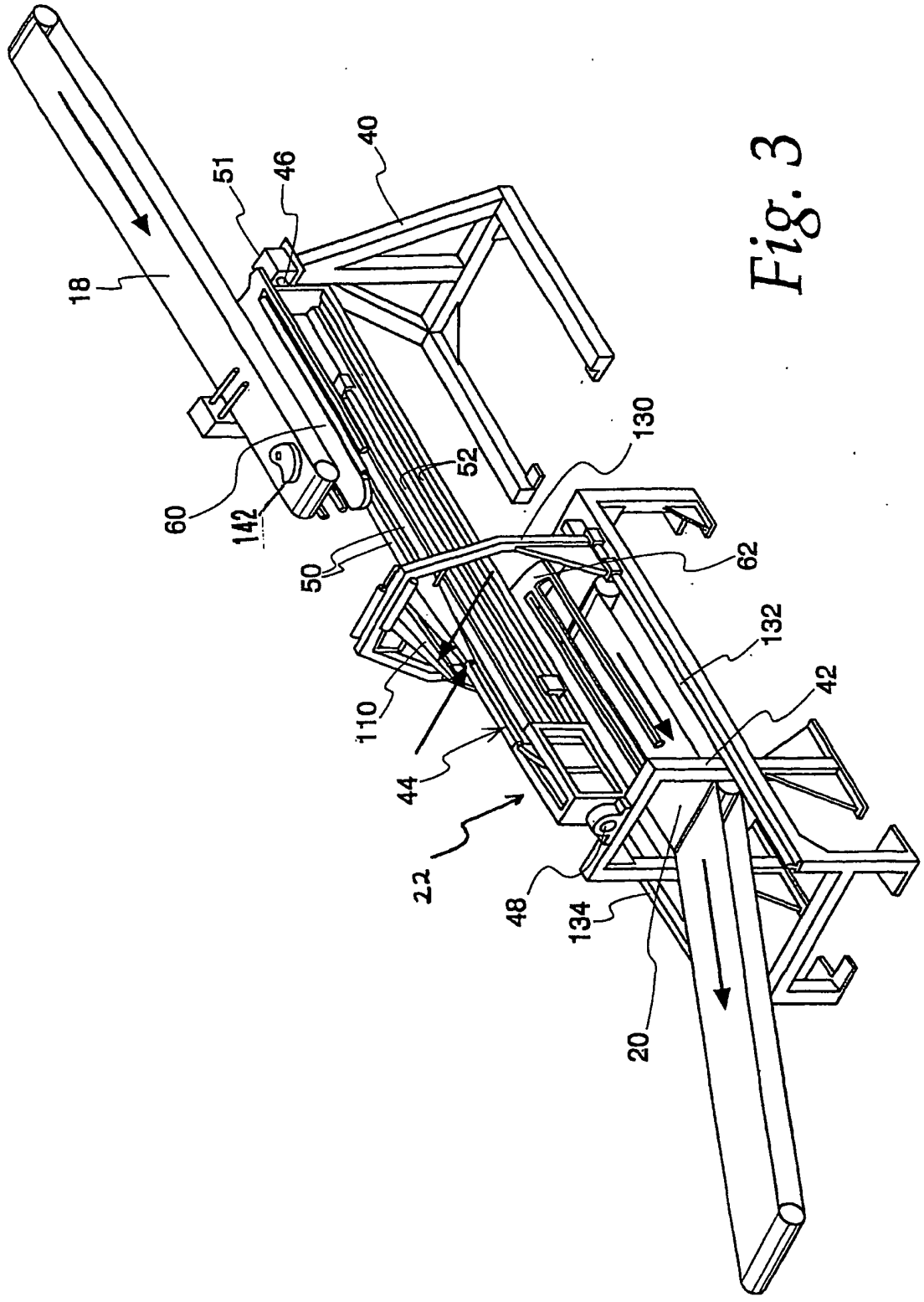

Fig. 3

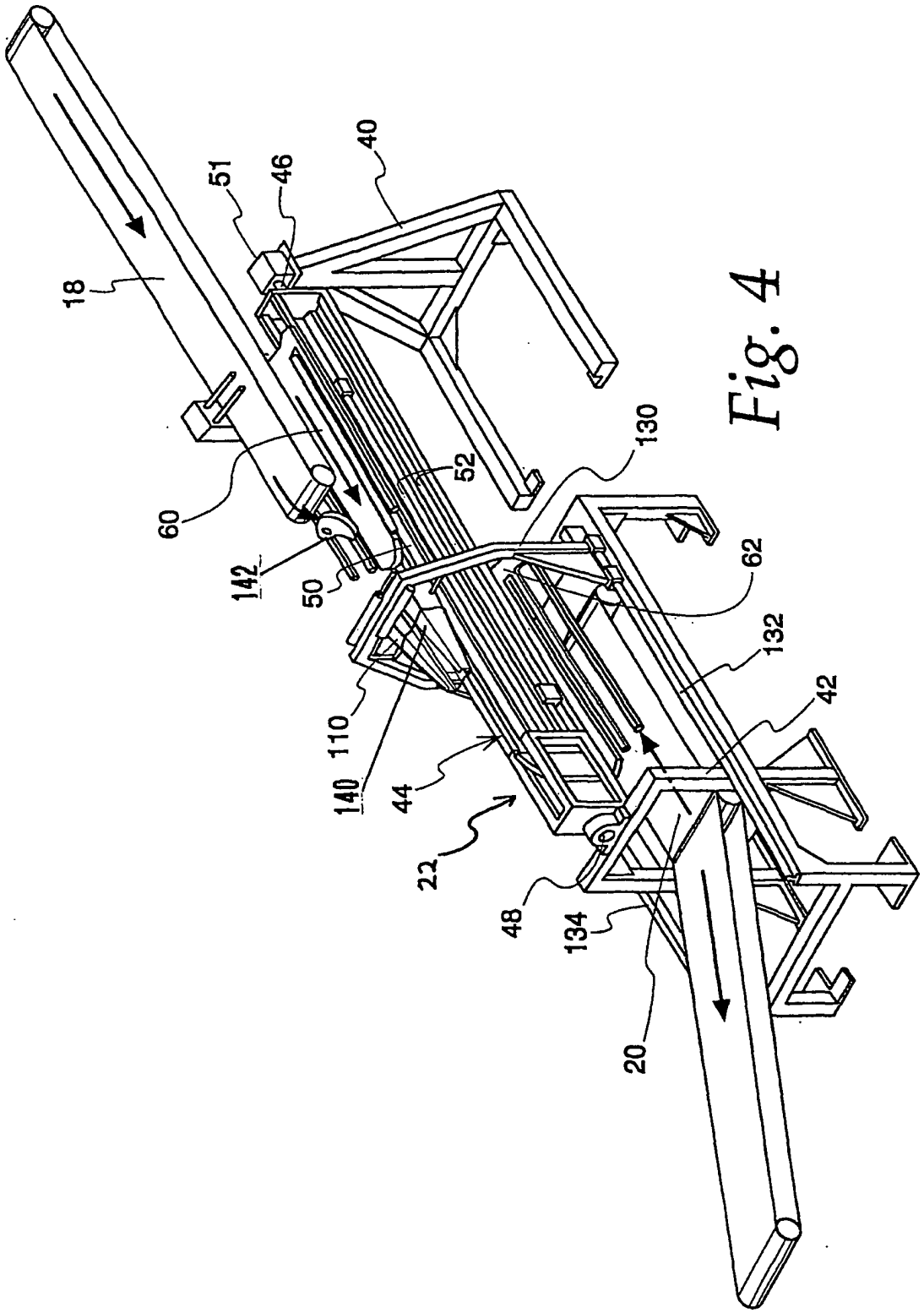

Fig. 4

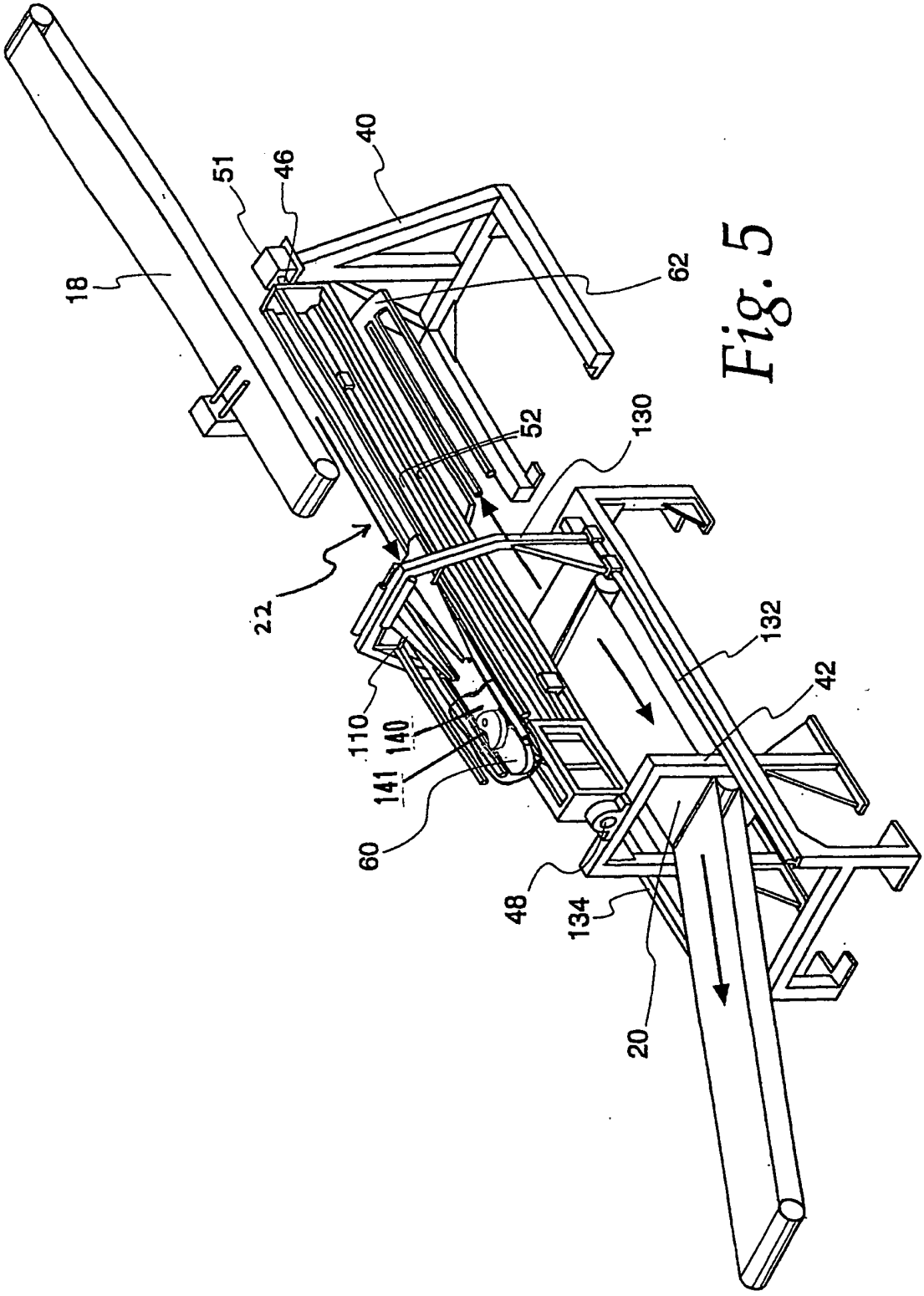

Fig. 5

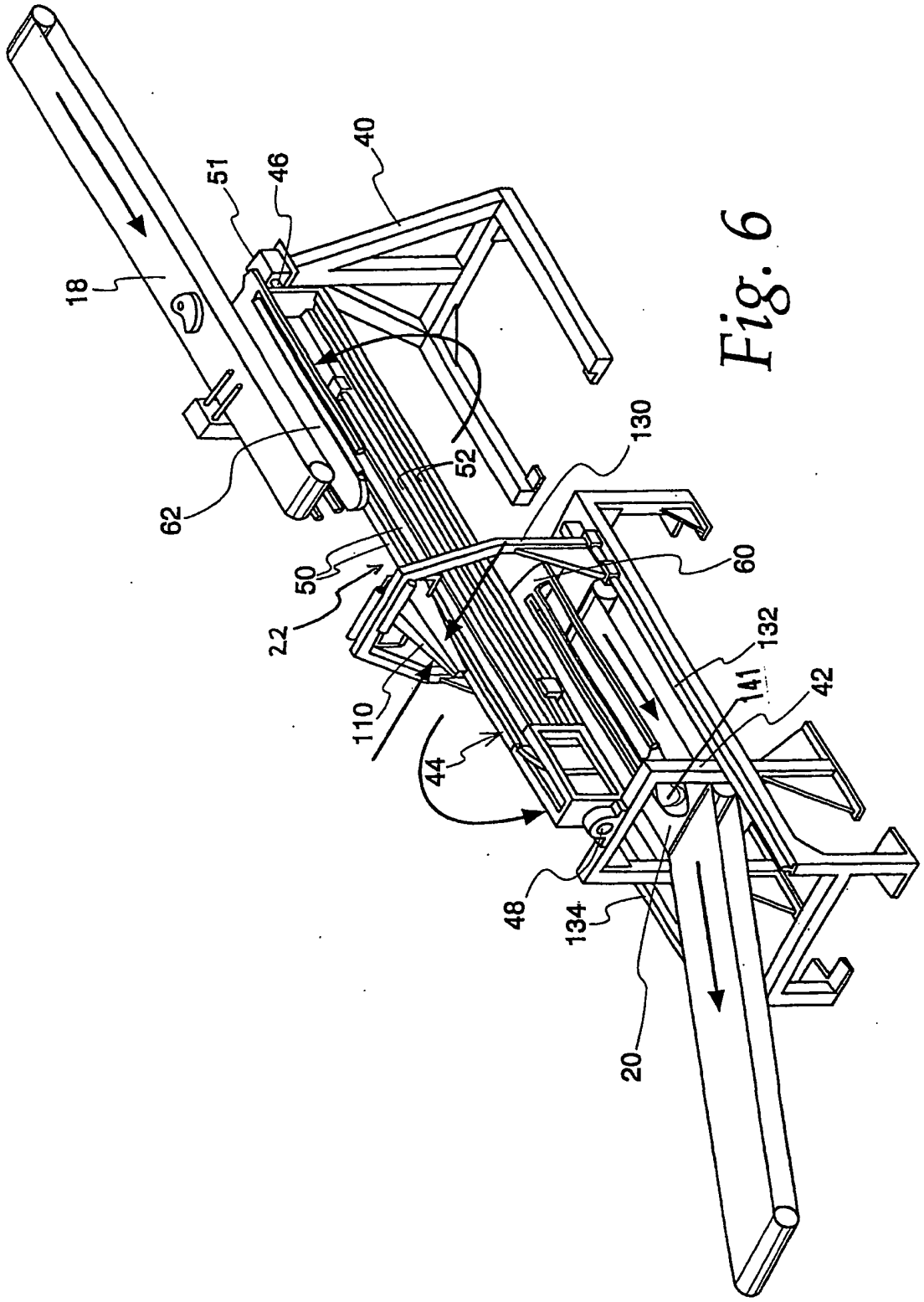

Fig. 6

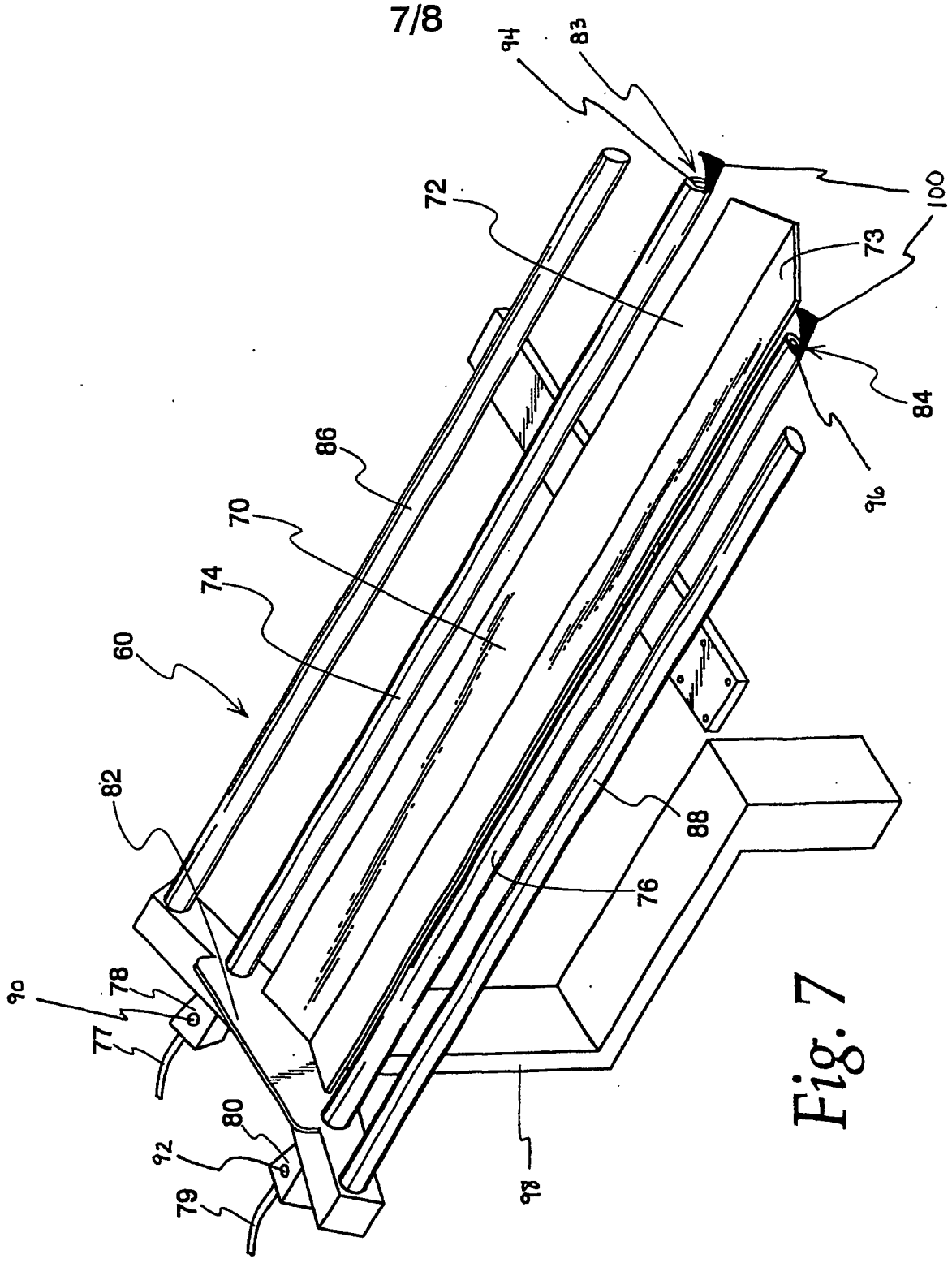

Fig. 7

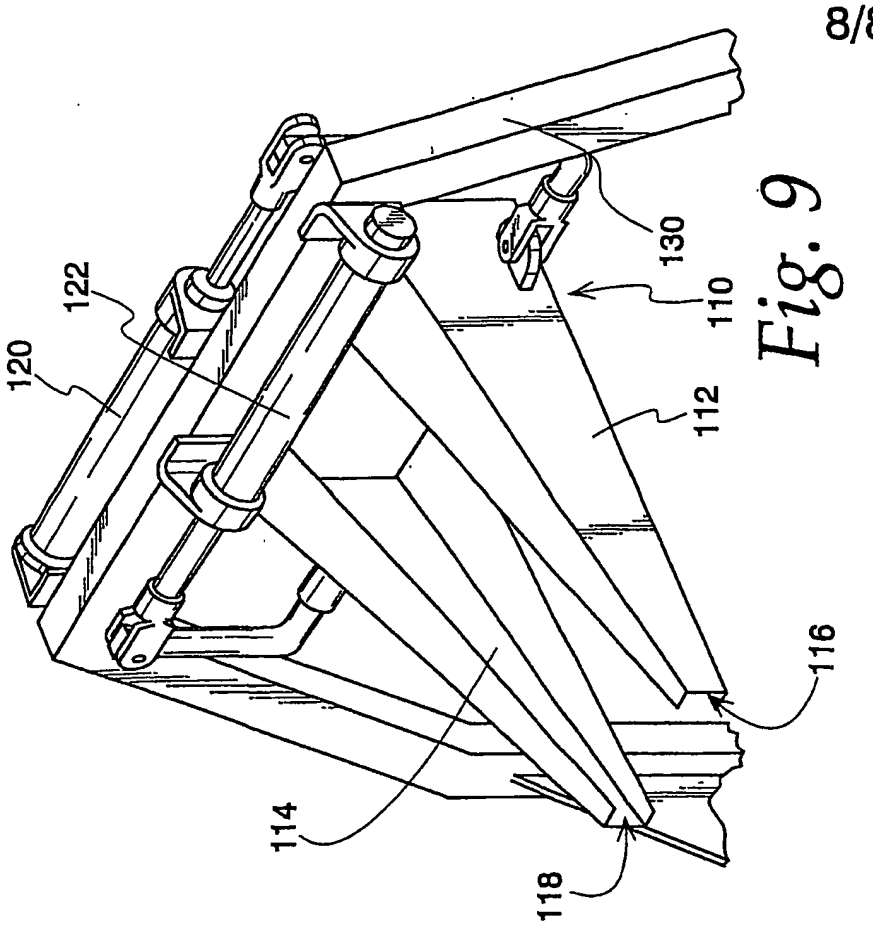

Fig. 9

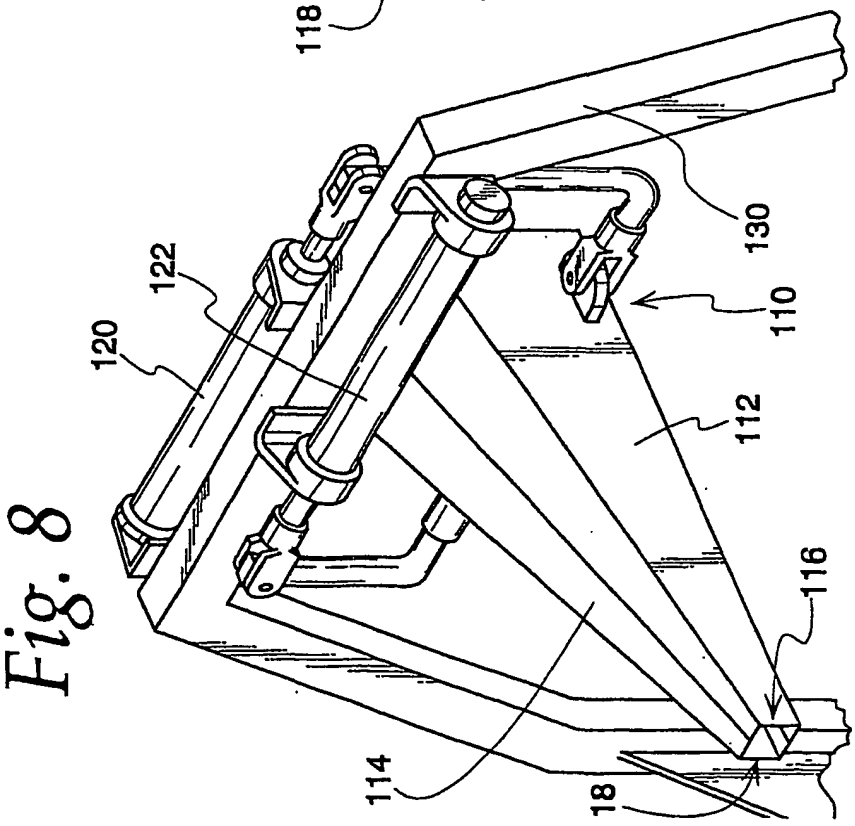

Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ02/00042

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: B65B 25/06 , B65B 5/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC B65B 25/06 , B65B 5/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

AU: B65B25/06 , B65B 5/04

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

ORBIT WPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 65341 A (MOBA HOLDINGS BARNEVELD B.V.) 24 NOVEMBER 1982 See entire specification	
X	EP 23831 A (KUREHA KAGAKU KOGYO KABUSHI KAISHA) 11 FUBRUARY 1981 See entire specification	36
X	FR 2465646 A (BEAUBEAU) 27 MARCH 1981 See entire specification	36

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 May 2002	22 MAY 2002
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer R. WEBER Telephone No : (02) 6283 2546

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ02/00042

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 2417159 A (MATHBIRK LTD) 30 OCTOBER 1975 See entire specification	36

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/NZ02/00042

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
EP	65341	AU	83666/82	DK	2123/82	ES	512169
		JP	57204821	NL	8102373		
EP	23831	AR	224542	AU	61114/80	BR	8004889
		CA	1148462	ES	494014	JP	8105659
		US	4419854	US	4553376	ZA	8004582
FR	2465646	NIL					
DE	2417159	NIL					

END OF ANNEX